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Risk-taking, Temper, and Impulsivity: An Investigation on the Effects of Dimensions of Self-control on Adolescent Violent and Minor Delinquency.

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Abstract

The current study explores potential disaggregated, simultaneous, and interactive effects of a composite scale measure of self-control on self-reported adolescent violent delinquency and minor delinquency. Using data from 616 Dutch adolescents participating in the Study of Peers, Activities, and Neighborhoods (SPAN), this exploratory study seeks to investigate the full utility of the self-control measure and its effect on adolescent delinquency. Specifically, this thesis explores if a composite measure of self-control—along with corresponding disaggregated measures—significantly predicts violent and minor delinquency independently from and simultaneously with one another. Interaction effects are also investigated with exploratory analysis. Using negative binomial regression, results indicated that self-control significantly predicted both adolescent violent delinquency and minor delinquency when examined as a composite measure and disaggregated into dimensional measures. Results further indicated that in simultaneous models, all dimensional measures of self-control significantly predicted violent delinquency; however, risk-taking was the only significant predictor of minor delinquency. This would suggest that dimensional measures of self-control influence varying types of delinquency differently which is inconsistent with the theory of self-control. Contributing preliminary findings to the self-control literature, impulsivity was found to moderate the relationship between risk-taking and minor delinquency in a longitudinal analysis. This suggests that the effect of risk-taking on minor delinquency does vary across levels of impulsivity and future research should investigate this finding further in other samples. This thesis argues that composite scale measures of self-control should be disaggregated to better understand how individual dimensions of self-control influence different forms of delinquency.

Keywords: self-control, risk-taking, temper, impulsivity, delinquency

Introduction

The purpose of this thesis is to investigate the effects of three dimensions of self-control—risk-taking, temper, and impulsivity—on adolescent violent and minor delinquency. Self-control is a prominent concept within the field of criminology and has gained a significant amount of empirical attention since its introduction in 1990 (Gottfredson & Hirschi, 1990). The most comprehensive statement of self-control and criminal conduct can be found in Gottfredson and Hirschi's *A General Theory of Crime* (1990). From this perspective, crime can be understood as being equally motivating to all, as human beings are rational actors that act in their own self-interest unless appropriately restrained. Individuals do not vary in their level of motivation (propensity) to commit crime, and instead vary on their relative levels of self-control (restraint) (Gottfredson & Hirschi, 1990). The difference between those who participate in crime and those who do not is the ability to restrain oneself by exercising self-control (Gottfredson & Hirschi, 1990). Gottfredson and Hirschi (1990) argue that individuals low in self-control are equally prone to participate in all types of delinquency and crime and would not specialize in any specific type. With that said, there is no theoretical justification for predicting what specific forms of negative behaviors low self-control individuals will engage in, as crime and other analogous behaviors are interchangeable until restraint (self-control) is considered—or thought about before making a decision (Gottfredson & Hirschi, 1990; Barlow, 1991). To be clear, Gottfredson and Hirschi claim that those low in self-control are more likely to participate *equally* in *all* forms of crime and deviance relative to those high in self-control.

Gottfredson and Hirschi (1990) define self-control as a unidimensional trait that

consists of six dimensions: risk-taking, temper (anger), impulsivity, physicality, self-centeredness, and a preference for simple tasks. Self-control has been conceptualized as a stable trait—being fully developed by age 8 to 10 years old—and invariant across the life-course (Gottfredson & Hirschi, 1990). They further claim that the above six dimensions of self-control, including the combination of the six (composite measure of low self-control) should predict all types of offending, crime, and analogous negative behaviors (Gottfredson & Hirschi, 1990). Grasmick, Tittle, Bursik, and Arneklev (1993) were the first to empirically test self-control and established a 24-item self-control scale—four-items for each dimension of self-control (risk-taking, temper, impulsivity, preference for physical tasks, simple tasks, self-centeredness) (Grasmick, Tittle, Bursik, & Arneklev, 1993).

There is disagreement within the field of criminology as to whether *individual* dimensions of self-control are better predictors of offending than a *composite* measure with combined dimensions (Grasmick et al., 1993; Arneklev, Grasmick, Tittle, & Bursik, 1993; Wood, Pfefferbaum, & Arneklev, 1993; Longshore, Turner, & Stein, 1996; Piquero & Rosay, 1998; Conner, Stein, & Longshore, 2008). Findings from Wood, Pfefferbaum, and Arneklev (1993) suggest that although a *composite* scale measure of self-control has considerable predictive power, the six dimensions outlined by Gottfredson and Hirschi (1990) should be treated as *independent* constructs to explain variation in different forms of delinquency (Wood, Pfefferbaum, & Arneklev, 1993).

Conflicting findings from Grasmick et al., (1993) propose that although the composite self-control (Grasmick et al. scale) scale consists of six dimensions, large eigenvalue differences between first and second-factor loadings suggest that these six

dimensions come together to form *one* unidimensional construct and should not be treated independently from one another (Grasmick et al., 1993). Using a modified version of the Grasmick et al. self-control scale, Longshore, Turner, and Stein (1996) concluded that a one-factor model of self-control (composite measure) did not adequately fit their data and that the use of a unidimensional self-control measure weakens the predictive power of the (self-control) construct (Longshore, Turner, & Stein, 1996). With inconclusive findings emerging with the use of the Grasmick et al. (1993) self-control scale, Piquero and Rosay (1998) reexamined the composite scale and their findings suggest that—unlike Longshore and colleagues (1996)—a one-factor model of self-control is a better fit for their data and the self-control construct appears to be unidimensional across both males and females (Piquero & Rosay, 1998).

In recent research, Ward, Nobles, and Fox (2015) performed a bifactor analysis on the effects of self-control and its elements (dimensions) on crime and victimization in a sample of Florida jail inmates. The purpose of their research was to identify how much variation can be explained by total (self-control) and individual (dimensions) scale measures of self-control, using the Grasmick et al. scale. Their findings suggest that a total scale measure of self-control explained roughly 40-87% of variance for the nine crime types examined. Additionally, these findings further indicated that individual scale measures do *exist* independently from a total scale measure and explain roughly 13-60% of variance, however concerns with measurement reliability may arise when using individual scales in replace of a total scale measure. Based on the above findings, the authors suggest that total scale measures of self-control can be used with confidence and individual scale measures should not be treated independently from a total scale measure

due to low measurement reliability (Ward, Nobles, & Fox, 2015).

This thesis investigates the full utility of the self-control measure by examining whether and how three dimensions of self-control—risk-taking, temper, and impulsivity—independently and jointly influence self-reported delinquency. Using data from the Study of Peers, Activities, and Neighborhoods, this thesis assesses composite effects (single self-control scale), disaggregated effects (risk-taking; temper; impulsivity subscales), and simultaneous effects (risk-taking + temper + impulsivity) of these dimensions on self-reported violent delinquency and minor delinquency[1]. Interaction effects are also examined through exploratory analysis.

Literature Review

Self-Control and Delinquency

Origins of Self-Control. In *A General Theory of Crime* (1990) Gottfredson and Hirschi claim that self-control is a natural human state characterized by a *lack* of self-control. Gottfredson and Hirschi (1990) argue that the main contributing factor for the development of self-control is through effective parenting practices. Effective parents teach their children to delay gratification and constrain immediate desires by monitoring, recognizing, and punishing inappropriate and bad behavior. Effective parenting results in their children developing a "future orientation" and learning to think of potential consequences of their behavior. Individuals who fail to develop self-control will be more likely to commit crime and other analogous behaviors such as gambling, unsafe sex,

[1]It is important to note that only three dimensional measures of self-control are examined because the composite self-control scale contained in the SPAN data only consists of three (risk-taking, temper, and impulsivity) component scale measures.

alcohol abuse, and drug use, and will be less successful in school and work than those with high levels of self-control (Gottfredson & Hirschi, 1990).

The stability hypothesis. The theory of self-control is both dynamic and static. Gottfredson and Hirschi (1990) make clear that levels of self-control are susceptible to influence through parenting practices until the ages of 8 to 10 years old (dynamic). After age 10, levels of self-control remain stable relative to others (static), and individuals can be ranked on their relative level of self-control (Sampson & Laub, 1993). Levels of self-control are not necessarily stable *within* individuals however, even after age 10. This is because, as Gottfredson and Hirschi (1990) claim, absolute levels of self-control within individuals can change as socialization processes continue throughout life. In other words, levels of self-control remain stable relative to others (differences between an individual with low self-control will remain relatively stable between an individual with high self-control), even though an individual with low self-control may improve on their absolute level of self-control (Gottfredson & Hirschi, 1990; Turner & Piquero, 2002).

Dimensionality of Self-Control. Although the original theory (1990) proposes that self-control is a unidimensional latent trait that consists of six second-order dimensions, the results examined within the self-control literature are inconclusive as to whether individual dimensions should be considered *independently* from an *overall* measure of self-control to predict various types of delinquency and crime. Previous research has demonstrated that the use of *individual* dimensions of self-control result in different behavior outcomes than using a *composite* scale measure of self-control. For example, findings from Arneklev, Grasmick, Tittle, and Bursik (1993) suggest that although a *composite* scale measure of low self-control predicted an expected positive relationship

with three imprudent behaviors—smoking, drinking, and gambling—when the measure is *disaggregated* into individual dimensions, the parameter estimates between two dimensions (simple tasks and preference for physical tasks) are not significant and in fact, the simple task dimension negatively predicted the three behaviors. These findings also indicated that the risk-taking dimension of self-control was the strongest predictor (largest beta size) of the three imprudent behaviors compared to the other five dimensions (Arneklev, Grasmick, Tittle, & Bursik, 1993).

Findings from Ward, Nobles, and Fox (2015) also suggest that the use of a total scale measure of self-control may obscure differences in behavior outcomes that dimensional measures may reflect. For example, the preference for physical tasks dimension explained more variance in their analysis than a total scale measure of self-control. This is also true for the preference for simple task dimension—which split equal variance with a total scale measure. Although it would appear that the use of dimensional measures would be the most appropriate way to measure self-control, Ward, Nobles, and Fox argue that a total scale measure should be the preferred method to measure self-control due to higher measurement reliability than using dimensional measures (Ward, Nobles, & Fox, 2015).

Additional findings from Wood et al., (1993) suggest that composite measures of self-control should be disaggregated into dimensional measures to predict various forms of crime, as the amount of variation explained in their models (R^2) increased with the use of individual dimension measures for each delinquency category (Wood et al., 1993). These findings additionally suggest that some dimensions are more predictive of certain types of crime than others (e.g. risk-taking was the strongest predictor of all offending

types besides illegal substance use). Findings from Conner, Stein, and Longshore (2008) also support similar conclusions and suggest that *individual* self-control measures are better predictors of drug use (temper), violence (temper and risk-taking), and property crime (risk-taking) than the use of a *composite* measure of self-control. This would suggest that aspects of low self-control are predictive of different types of delinquency than others—which would not be supportive of the theory's underlying assumption of equal crime motivation for those who possess low self-control.

Risk-taking. The concept of risk-taking has been of focus in multiple disciplines (e.g. criminology, sociology, psychology) and has been associated with many negative consequences including smoking, drinking, gambling (Arneklev et al., 1993), substance use, and crime (Conner, Stein, & Longshore, 2008). Risk-taking is a normal part of the adolescent lifestyle and is a main motivating force for risky law-breaking (e.g. shoplifting, vandalizing property, setting fire to property, taking a car for a joyride) (Wood et al., 1993). In particular, the 'rush' resulting from engaging in delinquency is more attractive to youth who like taking risks (Wood et al., 1993). Attraction to risk-taking behavior is not equally shared among everyone and there are reasons to believe that differences between individuals would exist—as some individuals are more likely to seek such (risk-taking) experiences (Gibbons, 1989; Katz, 1992). Risk-taking behavior results in rewarding sensations (intrinsic) regardless of any other (extrinsic) rewards the behavior may produce (Katz, 1989; Wood et al., 1993; Burt & Simons, 2013) and engaging in risk-taking behaviors—such as delinquency, substance use, and crime—would be appealing to those seeking to elevate their sensations (by participating in behaviors that provide a "rush") (Farley, 1986).

Temper. Temper is commonly identified as anger or, "an emotional state that varies in intensity form mild irritation to intense fury and rage," (Butcher & Spielberger, 1983, p.162). Anger is a natural human emotion that is often expressed through aggressive behavior when not adequately controlled (Denson, Pedersen, Friese, Hahm, & Roberts, 2014). Uncontrolled anger that arises from the inability to recognize and regulate early anger problems—typically starting in childhood—may result in anger disorders such as Oppositional and Conduct Disorder, Bipolar Disorder, Antisocial, Borderline, and Narcissistic Personality disorder (Denson et al., 2014).

Impulsivity. Impulsivity is commonly defined as action without planning, or the inability to delay instant gratification, and by limited consideration of possible negative consequences of one's actions (Gullo, Loxton, & Dawe, 2014; Paydary et al., 2016). Impulsivity is related to similar concepts such as novelty-seeking, adventuresomeness, and risk-seeking (Depue & Collins, 1999), and has been linked to several psychiatric disorders—borderline personality disorder, antisocial personality disorder, mania, and bulimia nervosa (DSM_IV, American Psychiatric Association)—psychopathology (Lynam, 1996), substance use (Wills, Vaccaro & McNamara, 1994), and crime (Moffit, 1993). Gottfredson and Hirschi (1990) incorporate impulsivity in their theory of low self-control and propose that those less capable of restraining immediate desires and understanding future consequences of actions are more likely to participate in crime and other analogous negative behaviors than those capable of restraining immediate gratification (Gottfredson & Hirschi, 1990).

Moderation. As discussed above, scholars have not reached a consensus as to whether a composite measure is the preferred method of measuring an individual's level

of self-control. There is also disagreement as to whether a composite measure of self-control (and its dimensional measures) should predict all forms of offending equally. Another issue with the self-control construct is that the dimensions of self-control might not combine additively to influence delinquency. This thesis seeks to investigate if dimensions of self-control moderate the influence of one another on adolescent violent delinquency and minor delinquency using exploratory analysis.

A few empirical studies (Hussong & Chassin, 1994; Colder & Stice, 1998) have examined moderating relationships between dimensions of self-control—impulsivity and temper—on substance use and delinquency. Findings from Hussong and Chassin (1994) demonstrate that impulsivity does not moderate the relationship between temper and substance use in a sample of adolescent. Attempting to investigate this relationship further, Colder and Stice (1998) examined potential moderating effects between impulsivity and temper on *substance use and delinquency* (person and property offenses) to identify if moderating effects emerged for different types of offending. Additionally, Colder and Stice (1998) examined these effects with both cross-sectional and longitudinal analyses using a sample of high school students. Findings suggest that impulsivity moderated the relationship between *temper* and *delinquency* in their cross-sectional analysis but did not moderate the relationship longitudinally. They suggest that moderating effects were most likely not identified longitudinally because very little change occurred in both outcome measures (substance use and delinquency) between time 1 (baseline) and time 2.

These findings also confirmed conclusions from Hussong and Chassin (1994) by indicating that interactive effects did not emerge between impulsivity and temper on

substance use (Colder & Stice, 1998). The authors suggest that this finding may have emerged because the two outcomes measured (substance use and delinquency) have "different psychological meaning in the current sample, as delinquency scores were more positively skewed than substance use scores," (Colder & Stice, 1998, p.269) Additionally, differences in skewness suggest that substance use may be a more *normative* form of behavior for high school students and high delinquency scores may be a sign of *severe* behavior problems. They continue to suggest that impulsivity may not moderate the effect of temper on normative behavior but may moderate the effect of temper on severe behavior problems. To be clear, the effect of impulsivity on substance use *does not* vary across levels of temper and the effect of impulsivity on delinquency *does* vary across levels of temper.

Current Study

This study explores the relationships between (1) a *composite* scale measure of self-control and violent delinquency and minor delinquency, (2) *disaggregated* measures of self-control—risk-taking, temper, and impulsivity—on violent delinquency and minor delinquency, and (3) *simultaneous* measures—risk-taking + temper + impulsivity—of self-control on violent delinquency and minor delinquency. To be clear, this thesis explores if using a model with *disaggregated measures* of self-control (risk-taking, temper, and impulsivity) will differentially predict behavior outcomes—violent delinquency and minor delinquency—than using a model with a *composite* scale measure of self-control. Moderation (interactive) effects are also explored through post hoc analysis to identify if individual dimensions moderate the influence of each other on two types of delinquency.

This thesis predicts that a composite measure of self-control will produce a negative and significant relationship with both forms of adolescent delinquency, suggesting that individuals high in self-control will be less likely to engage in violent and minor delinquency than those low in self-control (H1). This thesis also predicts that all three component scale measures will produce positive, significant relationships with violent delinquency and minor delinquency independently (H2, H3, H4) and additively (H5), suggesting that individuals high in risk-taking, temper, and impulsivity will be more likely to engage in violent delinquency and minor delinquency than those displaying low levels of risk-taking, temper, and impulsivity, respectively. Based on previous research from Hussong and Chassin (1994) and Colder and Stice (1998), this thesis seeks to explore—through post hoc analyses—potential moderating effects of individual dimensional measures of self-control (risk-taking, temper, and impulsivity) on violent delinquency and minor delinquency.

Methods

Data. All analyses utilize data from the Study of Peers, Activities, and Neighborhoods (SPAN), a two-wave, dual cohort, longitudinal survey of high-school students with the objective of understanding causes of delinquency behaviors for adolescents. The sample was collected from students in the Dutch city of The Hague—the third largest city in the Netherlands. Wave 1 began with a self-report questionnaire administered to 843 students from 10 schools during the 2008-2009 academic school year. Wave 2 consisted of a self-report questionnaire administered to 616 students during the 2010-2011 academic school year. In Wave 1, the younger cohort attended grade 1 (12-14 years old) and the older cohort attended grade 4 (15-16 years old). In Wave 2, the

younger cohort attended grade 3 (14-16 years old) and the older cohort attended higher education (grade 6, 17-18 years old), worked full or part-time, or were jobless.

The SPAN data are particularly useful for this study as they contain several pre-constructed and validated scales capturing key theoretical elements of self-control (e.g. risk-taking, temper, and impulsivity) and self-reported violent and minor delinquency. The multi-wave design allows for the prediction of multiple types of delinquency by establishing temporal ordering and allowing for the control of confounding variables.

Variables. Descriptive statistics for predictor, outcome, and control variables are included in Table 1. Bivariate correlations for all scales are included in Table 2.

Dependent Variables. Two dependent variables are used to account for variation in crime type—self-reported violent delinquency and minor delinquency, as measured at Wave 2. The assumptions of self-control theory—as outlined by Gottfredson and Hirschi (1990)—claim that differences in a composite measure of self-control (or disaggregated measures) would not emerge based on the use of disaggregated measures of delinquency (or the use of more than one type). However, the basis of this study is exploratory in nature and two dependent variables—to distinguish between delinquency types—were used to identify if any preliminary results emerge based on the use of more than one form of delinquency.

Violent delinquency is a five-item frequency index of self-reported violence (alpha=0.81). Respondents were asked to answer, "During the past year, how often have you… (1) Threatened someone to scare that person or make him or her do something? (2) Kicked or hit somebody on the street (we do NOT mean play and horsing around)? (3) Kicked or hit somebody that got injured as a result? (4) Carried a knife or other weapon?

and (5) Used a knife or other weapon?" Responses ranged from a minimum of 0 to a maximum of 22.

Minor delinquency is an eight-item frequency scale of self-reported minor delinquency measured at Wave 2 (alpha=0.79; minimum values rounded 0.00 due to having a negative minimum value in the original data set). Respondents were asked to answer, "During the past year, how often have you…(1) Plastered walls, doors, or other objects with paint, pen, or spray paint? (2) Damaged or destroyed something, for example bicycles, bus stop shelters, lampposts, or something else? (3) Set fire (for example in a building, house, bus, or car? (4) Stolen something from a store that was worth less than 5 euro, for example, clothing, DVD's, or something else? (5) Stolen something worth more than 5 euro, for example, clothing, DVD's or something else? (6) Bought something from someone while you knew or thought it was stolen, for example, a bicycle, clothes, or something else? (7) Stolen a bicycle? and (8) Stolen a scooter or moped?" Responses ranged from a minimum of 0 to a maximum of 29.

Independent variables. The three *component* scales and the *composite* self-control scale are included in the analyses as additive measures, measured at baseline. Items along with factor loadings of the *composite* self-control and three *component* scales are included in the Appendix.

Risk-taking is measured using a three-item scale measured at Wave 1 (alpha=0.72). The alpha reliability of the risk-taking subscale would have declined with the exclusion of any one item. Respondents were asked to answer how much they agree with the following statements: (1) I sometimes find it exciting to do things that may be dangerous, (2) I often do things without thinking of the consequences, and (3) Sometimes

I will take a risk just for the fun of it. Responses ranged from a minimum of 0 to a maximum of 12.

Temper is measured using a four-item scale measured at Wave 1 (alpha=0.59). The alpha reliability of the temper subscale would have declined with the exclusion of any one item. Respondents were asked to answer how much they agree with the following statements: (1) When I have an argument with someone, I can talk it out calmly, (2) I get angry very fast, (3) When I am really angry, other people better stay away from me, and (4) I get easily bored. Responses ranged from a minimum of 0 and a maximum of 16.

Impulsivity is measured using a two-item scale measured at Wave 1 (alpha=0.53). The alpha reliability of the impulsivity subscale would have declined with the exclusion of any one item. Respondents were asked to answer how much they agree with the following statements: (1) I always say what I think, even if it is not nice or smart and (2) If I want something, I do it immediately. Responses ranged from a minimum of 0 and a maximum of 8.

Self-control is measured using a ten-item cumulative scale (9 combined items from the above component scales with the addition of one variable) measured at Wave 1 (alpha=0.75). The alpha reliability of the *composite* ten-item self-control scale would have declined with the exclusion of any one item. Respondents were asked to answer how much they agree with the above statements included in the three component scales of self-control—risk-taking, temper, and impulsivity. The final scale included the addition of one variable, "I often try to avoid things that I know will be difficult," with respondents answering how much they agreed with that statement. Responses ranged

from a minimum of 0 to a maximum of 35.

Control Variables. The analyses control for demographics—ethnicity, gender, and cohort—measured at Wave 1. All controls were recoded as dummy variables (0,1) with those variables coded as 0 representing the reference category. The variables were recoded as follows: cohort (1=0, 4=1), gender (male=0, female=1), and ethnicity (Western=0, nonwestern=1). Variables included in the models are cohort grade 4, female, and nonwestern descent.

[TABLE 1 about here]

Analytic Strategy

This thesis seeks to identify if *disaggregated* measures of self-control are predictive of certain types of delinquency, which would suggest that individuals with low self-control may specialize in delinquency types depending on levels of a particular dimension. All analyses use SPAN data collected from a total of 843 participants in Wave 1 and 616 participants in Wave 2. The average age of the sample was grade 1 (12-14 years old) with the majority being Male (52.6%) and from Native Dutch descent (55.14%).

A series of negative binomial regression analysis was used to determine if a *total* scale measure of self-control and three *component* scale measures—risk-taking, temper, and impulsivity—significantly affect respondents' violent and minor delinquency. The *composite* self-control measure and the three *component* scale measures are assessed with separate negative binomial regression analysis for violent delinquency and minor delinquency to determine if a *composite* measure and three *dimensional* measures significantly predict violent and minor delinquency in conjunction with and

independently from one another. This thesis uses negative binomial regression analyses since the SPAN data contain over dispersed (variance within the data is greater than would be expected in a theoretical model), count-based (non-negative integer) measures.

Results

Bivariate Correlations. Table 2 outlines the bivariate correlations for all predictor and outcome variables. Risk-taking (-0.81), temper (-0.80), and impulsivity (-0.62) are all strongly associated with the composite measure of self-control. Additionally, minor delinquency (0.58) is strongly associated with violent delinquency. All component measures are weakly (under 0.50) associated with one another and are also weakly associated with violent delinquency and minor delinquency.

[TABLE 2 about here]

Violent Delinquency. Table 3 presents the results of a series of negative binomial regression analyses of violent delinquency with the inclusion of control variables (gender, cohort, and ethnicity). Log odds (estimates) along with associated standard errors are included in the models as unstandardized regression coefficients. Log odds can be interpreted as follows, "For each one-unit increase in the independent variable, the expected log count of the dependent variable is expected to change by (log odd)," (Long, 2014, p.36).

Support for hypothesis 1 was found. Results from Model 1 indicated a negative, significant relationship between a *composite* measure of self-control and violent delinquency with the inclusion of control variables (gender, cohort, ethnicity) (log odds= -0.09, p=0.000). For each one-unit increase in *self-control*, the expected log count of self-reported violent delinquency is expected to decrease by -0.09 (Model 1; Table 3). Gender

was found to be a statistically significant (negative) predictor of violent delinquency (log odds= -1.02, p=0.000). Cohort and ethnicity displayed nonsignificant results (Model 1; Table 3).

Models 2, 3, and 4 (Table 3) examined the effects of *disaggregated* self-control measures on violent delinquency to identify if dimensional measures of self-control significantly and positively predict violent delinquency.

Model 2 included *risk-taking* in the analysis. Support for hypothesis 2 was found. Model 2 indicated a positive, significant relationship between risk-taking and violent delinquency (log odds=0.16, p=0.000). For each one-unit increase in *risk-taking*, the expected log count of self-reported violent delinquency is expected to increase by 0.16 (Model 2; Table 3). Gender (log odds= -0.99, p=0.000) was found to be a statistically significant (negative) predictor of violent delinquency while cohort and ethnicity displayed nonsignificant results (Model 2; Table 3).

Model 3 included *temper* in the analysis. Support for hypothesis 3 was found. Model 3 indicated a significant, positive relationship between temper and violent delinquency (log odds=0.15, p=0.000). For each one-unit increase in temper, the expected log count of self-reported violent delinquency is expected to increase by 0.15 (Model 3, Table 3). Gender was found to be a statistically significant (negative) predictor of violent delinquency (log odds= -1.03, p=0.000). Cohort and ethnicity displayed nonsignificant results (Model 3; Table 3).

Model 4 included *impulsivity* in the analysis. Model 4 indicated a positive, significant relationship between impulsivity and violent delinquency (log odds=0.23, p=0.000)—supporting hypothesis 4. For each one-unit increase in *impulsivity*, the

expected log count of self-reported violent delinquency is expected to increase by 0.23 (Model 4, Table 3). Gender (log odds= -1.19, p=0.000) and cohort (log odds= -0.67, p=0.005) were found to be statistically significant (negative) predictors of violent delinquency. Ethnicity however, displayed nonsignificant results (Model 4; Table 3).

Model 5 included all three *disaggregated* measures of self-control in the analysis simultaneously. Support for hypothesis 5 was found. Results from Model 5 indicated a positive, significant relationship between risk-taking (log odds=0.09, p=0.006), temper (log odds=0.10, p=0.001), and impulsivity (log odds=0.11, p=0.023) on violent delinquency. For each one-unit increase *risk-taking*, the expected log count of self-reported violent delinquency is expected to increase by 0.09. For each one-unit increase in *temper*, the expected log count of self-reported violent delinquency is expected to increase by 0.10. For each one-unit increase in *impulsivity*, the expected log count of self-reported violent delinquency is expected to increase by 0.11 (Model 5, Table 3). Gender was found to be a statistically significant (negative) predictor of violent delinquency (log odds= -1.02, p=0.000). Cohort and ethnicity displayed nonsignificant results (Model 5; Table 3).

Moderation was explored in Model 6 with the creation and inclusion of the (mean-centered) interaction variable (*Impulsivity by Temper*). Results indicated a negative relationship between the interaction term (*Impulsivity by Temper*) and violent delinquency; however, the parameter estimate is not significant (Model 6, Table 3). Model 6 did however, indicate a positive, significant relationship between *temper* and violent delinquency (log odds=0.13, p=0.000) and a positive, significant relationship between *impulsivity* and violent delinquency (log odds=0.16, p=0.001). For each one-unit

increase in *temper*, the expected log count of self-reported violent delinquency is expected to increase by 0.13. For each one-unit increase in *impulsivity*, the expected log count of self-reported violent delinquency is expected to increase by 0.16 (Model 6, Table 3). Gender (log odds= -1.06, p=0.000) and cohort (log odds=-0.51, p=006) were found to be statistically significant (negative) predictors of violent delinquency. Ethnicity displayed nonsignificant results (Model 6; Table 3).

[TABLE 3 about here]

Minor Delinquency. Table 4 presents a series of negative binomial regression analyses on adolescent minor delinquency with the inclusion of control variables (gender, cohort, and ethnicity). Model 1 included the *composite* self-control measure in the analysis. Support for hypothesis 1 was found. Results from Model 1 indicated a negative, significant relationship between a composite measure of self-control and minor delinquency (log odds= -0.07, p=0.000). For each one-unit increase in *self-control*, the expected log count of self-reported minor delinquency is expected to decrease by 0.07 (Model 1, Table 4). Gender (log odds= -0.55, p=0.000) and cohort (log odds= -0.56, p=0.000) were found to be statistically significant (negative) predictors of minor delinquency. Ethnicity however, displayed nonsignificant results (Model 1, Table 4).

Models 2, 3, and 4 (Table 4) examined the effects of *disaggregated* measures of self-control on minor delinquency to identify if dimensional measures of self-control significantly and positively predict minor delinquency.

Model 2 included *risk-taking* in the analysis. Support for hypothesis 2 was found. Model 2 indicated a positive, significant relationship between risk-taking and minor delinquency (log odds=0.16, p=0.000). For each one-unit increase in *risk-taking*, the

expected log count of self-reported minor delinquency is expected to increase by 0.16 (Model 2, Table 4). Gender (log odds= -0.50, p=0.000) and cohort (log odds= -0.62, p=0.002) were found to be statistically significant (negative) predictors of minor delinquency. Ethnicity however, displayed nonsignificant results (Model 2, Table 4).

Model 3 included *temper* in the analysis. Hypothesis 3 was supported. Model 3 indicated a significant, positive relationship between temper and minor delinquency (log odds=0.07, p=0.002). For each one-unit increase in *temper*, the expected log count of self-reported minor delinquency is expected to increase by 0.07 (Model 3, Table 4). Gender (log odds= -0.66, p=0.000) and cohort (log odds= -0.64, p=0.000) were found to be statistically significant (negative) predictors of minor delinquency. Ethnicity however, displayed nonsignificant results (Model 3, Table 4).

Model 4 included *impulsivity* in the analysis. Hypothesis 4 was supported. Model 4 indicated a positive, significant relationship between impulsivity and minor delinquency (log odds=0.14, p=0.000). For each one-unit increase in *impulsivity*, the expected log count of self-reported minor delinquency is expected to increase by 0.14 (Model 4, Table 4). Gender (log odds= -0.72, p=0.000) and cohort (log odds= -0.79, p=0.000) were found to be statistically significant (negative) predictors of minor delinquency. Ethnicity however, displayed nonsignificant results (Model 4, Table 4).

Model 5 included all *disaggregated* measures (additive) of self-control in the analysis simultaneously. Partial support for hypothesis 5 was found. *Risk-taking* displayed significant results (log odds=0.14, p=0.000), however, the parameter estimates for *temper* and *impulsivity* are not statistically significant. For each one-unit increase in *risk-taking*, the expected log count of self-reported minor delinquency is expected to

increase by 0.14 (Model 5, Table 4). Gender (log odds= -0.51, p=0.000) and cohort (log odds= -0.63, p=0.000) were found to be statistically significant (negative) predictors of minor delinquency. Ethnicity however, displayed nonsignificant results (Model 5, Table 4).

Moderation was explored in Model 6 with the creation and inclusion of the (mean-centered) interaction variable (*Impulsivity by Risk-Taking*). Figure 1 displays a graph of the effect of risk-taking on minor delinquency across levels—one standard deviation (1.72) above and below the mean (4.77)—of impulsivity. Results indicated a negative, significant relationship between the interaction variable and minor delinquency (log odds= -0.03, p=0.022)—suggesting that the effect of risk-taking on self-reported minor delinquency is weaker for more highly impulsive adolescents. To be clear, the effect of risk-taking on self-reported delinquency is reduced at higher levels of impulsivity. Results from Model 6 also indicated a positive, significant main effect between risk-taking and minor delinquency (log odds=0.15, p=0.000); however, the parameter estimate for impulsivity is not statistically significant (log odds=0.08, p=0.057). For each one-unit increase in *risk-taking*, the expected log count of self-reported minor delinquency is expected to increase by 0.15. Gender (log odds= -0.52, p=0.000) and cohort (log odds= -0.66, p=0.000) were found to be statistically significant (negative) predictors of minor delinquency. Ethnicity however, displayed nonsignificant results (Model 6, Table 4).

[TABLE 4 about here]

Model Fit. With a significant moderating effect emerging between the interaction term (impulsivity by risk-taking) and minor delinquency through exploratory analysis, a

log likelihood test (used to test model fit of nested models) was used to determine if the interaction term is a better fit for the SPAN data than using a model with main effects (impulsivity and risk-taking) alone. Results indicated that the interaction term was in fact, a better fit for the data (Log Likelihood Test Statistic=5.11) than a model containing only main effects (impulsivity and risk-taking simultaneously).

Discussion

This thesis examined whether a composite measure of self-control—along with corresponding dimensional measures—significantly predict self-reported adolescent violent and minor delinquency, using data from the Study of Peers, Activities, and Neighborhoods. The purpose of this thesis was to investigate the full utility of the self-control measure—as outlined by Gottfredson and Hirschi—and test if the self-control construct predicts delinquency when employed as a composite measure, disaggregated measures, and simultaneous measures in a more recent sample of adolescents.

Results further indicated that the influence of three dimensions of self-control varied between the two types of delinquency—violent and minor—with the inclusion of control variables (gender, cohort, and ethnicity). Consistent with prior research (and the theory of self-control), a composite measure of self-control significantly and negatively predicted both *violent* delinquency (log odds= -0.09) and *minor* delinquency (log odds= -0.07). As expected, results indicated that all three dimensions of self-control used in this study significantly and positively predicted *violent* delinquency (Table 3) when examined independently and simultaneously (consistent with the theory of self-control). Impulsivity displayed the largest effect size on violent delinquency (Model 4, Table 3) when examined alone (log odds=0.23) and simultaneously (log odds=0.11 vs. log odds=0.10

and log odds=0.09); however, effect size (log odds) included in the models are not standardized and therefore, cannot be compared to the effect sizes of the other two dimensions (Model 5, Table 3). Although all dimensional measures of self-control (risk-taking, temper, and impulsivity) significantly and positively predicted violent delinquency, effect sizes decreased for all dimensional measures of self-control in the simultaneous model (Model 5) compared to the disaggregated models (Model 2, Model 3, Model 4). For example, the effect size for risk-taking included independently (log odd=0.16) is lower than the effect size for risk-taking included simultaneously (log odds=0.09) with the other dimensional measures. The same can be said for the temper (log odds=0.15 vs. log odds=0.10) and impulsivity (log odds=0.23 vs. log odds=0.11) dimensions. This would suggest that some variation explained with the use of disaggregated measures of self-control overlaps with variation explained by the other dimensions.

As expected, all dimensional measures significantly and positively predicted *minor* delinquency (with inclusion of controls) when examined independently from one another (Table 4), however, when examined simultaneously, results indicated that *risk-taking* was the only significant predictor of minor delinquency, as the parameter estimates for temper and impulsivity were not significant (Model 5, Table 3). This is inconsistent with the theory of self-control and suggests that the risk-taking dimension is the only predictor of minor delinquency (when included simultaneously) and should be considered independently from a composite measure and other dimensional measures of self-control when identifying at-risk youth.

In regards to interaction effects, this study provides some evidence supporting

past research (Hussong and Chassin, 1994; Colder and Stice, 1998) that impulsivity does not moderate the relationship between temper and delinquency in a longitudinal analysis as the parameter estimate for the interaction term in Model 6 (Table 3) is not significant for violent delinquency. Adding preliminary findings to the self-control literature, impulsivity was found to moderate the relationship between risk-taking and minor delinquency (Model 6, Table 4) as the parameter estimate for the interaction term was significant (log odds= -0.03). This suggests that the effect of risk-taking on minor delinquency does vary across levels of impulsivity since results indicated that the effect of risk-taking on minor delinquency weakens as levels of impulsivity increase (Figure 1). This thesis continues to expand on the self-control literature by demonstrating that the interaction between impulsivity and risk-taking is a better fit for the data used in this study than using main effects alone, which would be inconsistent with the theory of self-control.

Limitations

This study incorporates the use of only three dimensional measures of self-control (risk-taking, temper, and impulsivity) as these were the only available measures included in the SPAN data. It is important to note that all scales (composite self-control scale, risk-taking, temper, and impulsivity subscales) were pre-constructed prior to gaining access to the SPAN data (e.g. scale items could not be modified). The alphas for the risk-taking (alpha=0.72), temper (alpha=0.59), and impulsivity (alpha=0.53) component scales are considerably low compared to the composite self-control scale (alpha=0.75) which may be an unexpected outcome resulting from the use of pre-constructed scales. To be clear, some of the items included in the subscales (e.g. (1) the item in the risk-taking dimension,

"I often do things without thinking of the consequences," may be more representative of the impulsivity dimension of self-control and (2) the item in the temper dimension, "I get easily bored," may be more representative of the risk-taking dimension).

This study does not utilize a random sample and is thus, not representative of Dutch adolescents. The lack of a random sample may additionally not be representative of youth in an American, urban city such as Saint Louis, Missouri. Only two measures of self-reported delinquency are used to test the *general theory* assumption of self-control theory and—although the purpose of this thesis was to provide an exploratory analysis—some would consider this a limitation. Future research should include multiple types of delinquency (e.g. serious delinquency and drug selling) and analogous imprudent behaviors (e.g. substance use, smoking, and gambling) to further indicate whether low self-control individuals are equally likely to engage in all forms of delinquency (and other analogous behaviors) or are more likely to engage in only certain types (specialize).

Conclusion

This thesis examined the longitudinal influence of three dimensions of self-control—risk-taking, temper, and impulsivity—on adolescent violent and minor delinquency using data from youth participating in the Study of Peers, Activities, and Neighborhoods (SPAN). This thesis additionally investigated whether a composite measure of self-control and individual dimensional measures predict self-reported violent delinquency and minor delinquency in a non-American sample. Consistent with prior research, a composite measure of self-control along with independent and simultaneous dimensional measures, are suitable predictors of *violent* delinquency. However, only the risk-taking dimension is a significant predictor of *minor* delinquency when all

dimensional measures are included *simultaneously* in the model (even though a composite measure and independent dimensional measures were significant for minor delinquency). Future research should replicate this finding in different samples.

Although results from this study mostly support the generalizability of Gottfredson and Hirschi's theory of self-control (composite measure of self-control and dimensional measures significantly predict adolescent violent delinquency) based on the finding that risk-taking was the only significant predictor of minor delinquency—when included simultaneously in the model—this thesis recommends that the risk-taking dimension should be considered independently when identifying which youth are more likely to engage in minor delinquent acts. Additionally, this thesis recommends that composite measures of self-control should be disaggregated into dimensional measures—since results indicated that the influence of dimensions of self-control varied between the two types of delinquency—to best understand how these dimensions influence various forms of delinquency. With significant interaction effects emerging between impulsivity and risk-taking on minor delinquency (the effect of risk-taking on minor delinquency is weaker for highly impulsive adolescents), future research should investigate and replicate this finding further to better understand how self-control dimensions influence the effect of one another on delinquency to identify if modifications need to be considered for the theory of self-control.

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Table 1: *Descriptive Statistics*					
	Mean	SD	Min	Max	Alpha
Demographics					
Gender	0.45	0.50	0.00	1.00	
Cohort	0.50	0.50	0.00	1.00	
Ethnicity	0.45	0.50	0.00	1.00	
Wave 1 Predictors					
Self-Control	19.43	6.32	0.00	35.00	0.75
Risk-taking	5.69	2.94	0.00	12.00	0.72
Temper	8.12	3.10	0.00	16.00	0.59
Impulsivity	4.77	1.72	0.00	8.00	0.53
Wave 2 Outcomes					
Violent Delinquency	1.71	3.40	0.00	22.00	0.81
Minor Delinquency	2.57	4.18	0.00	29.00	0.79

Abbr: SD—Standard Deviation
Source: Study of Peers Activities and Neighborhoods

Table 2: *Bivariate Correlations*							
		I	II	III	IV	V	VI
I	Self-Control	1.00					
II	Risk-Taking	-0.81	1.00				
III	Temper	-0.80	0.43	1.00			
IIII	Impulsivity	-0.62	0.38	0.31	1.00		
V	Violent Delinquency	-0.32	0.26	0.28	0.18	1.00	
VI	Minor Delinquency	-0.29	0.28	0.21	0.13	0.58	1.00

Notes: Subscales are reversed in polarity (e.g., higher values reflect less risk-taking, temper, and impulsivity).
Source: Study of Peers Activities and Neighborhoods

Table 3: *Negative Binomial Regression of Self-Control, Risk-Taking, Temper, and Impulsivity on Self-Reported Violent Delinquency (N=610)*

	Model 1 H.1		Model 2 H.2		Model 3 H.3		Model 4 H.4		Model 5 H.5		Model 6 Exploratory	
	Composite		Disaggregated		Disaggregated		Disaggregated		Simultaneous		Multiplicative	
	Log	se	Log	se	Log	se	Log	se	Log	se	Log	se
Constant	2.66	0.28***	-0.03	0.21	-0.39	0.26	-0.01	0.24	-1.37	0.37***	-0.46	0.25
Gender	-1.02	0.16***	-0.99	0.16***	-1.03	0.16***	-1.19	0.16***	-1.02	0.16***	-1.06	0.16***
Cohort	-0.27	0.21	-0.37	0.21	-0.19	0.22	-0.67	0.22**	-0.32	0.22	-0.51	0.02**
Ethnicity	-0.03	0.21	-0.01	0.22	-0.02	0.21	-0.29	0.22	-0.00	0.22	0.09	0.22
Self-Control	-0.09	0.01***	---	---	---	---	---	---	---	---	---	---
Risk-Taking	---	---	0.16	0.03***	---	---	---	---	0.09	0.03**	---	---
Temper	---	---	----	----	0.15	0.03***	---	---	0.10	0.03***	0.13	0.03***
Impulsivity	---	---	---	---	---	---	0.23	0.05***	0.11	0.05*	0.16	0.05***
Impulsivity* Temper	---	---	---	---	---	---	---	---	---	---	-0.00	0.02

Abbr: Log—Log Odds; SE—Standard Error

*p < 0.05 level

**p < 0.01 level

***p < 0.001 level

Source: Study of Peers Activities and Neighborhoods

Table 4: *Negative Binomial Regression of Self-Control, Risk-Taking, Temper, and Impulsivity on Self-Reported Minor Delinquency (N=610)*

	Model 1 H.1		Model 2 H.2		Model 3 H.3		Model 4 H.4		Model 5 H.5		Model 6 Exploratory	
	Composite		Disaggregated		Disaggregated		Disaggregated		Simultaneous		Multiplicative	
	Log	se	Log	se	Log	se	Log	se	Log	se	Log	se
Constant	2.60	0.23***	0.39	0.18**	0.82	0.21***	0.76	0.21***	0.12	0.25	0.14	0.22
Gender	-0.55	0.13***	-0.50	0.13***	-0.66	0.13***	-0.72	0.13***	-0.51	0.13***	-0.52	0.13***
Cohort	-0.56	0.20***	-0.62	0.20 **	-0.64	0.20***	-0.79	0.20***	-0.63	0.20***	-0.66	0.20***
Ethnicity	-0.03	0.20	-0.05	0.20	0.08	0.20	0.16	0.20	-0.03	0.20	-0.04	0.20
Self-Control	-0.07	0.01***	---	---	---	---	---	---	---	---	---	---
Risk-Taking	---	---	0.16	0.02***	---	---	---	---	0.14	0.03***	0.15	0.03***
Temper	---	---	----	----	0.07	0.02**	---	---	0.01	0.02	---	---
Impulsivity	---	---	---	---	---	---	0.14	0.04 ***	0.06	0.04	0.08	0.04
Impulsivity* Risk-taking	---	---	---	---	---	---	---	---	---	---	-0.03	0.01*

Abbr: Log—Log Odds; SE—Standard Error

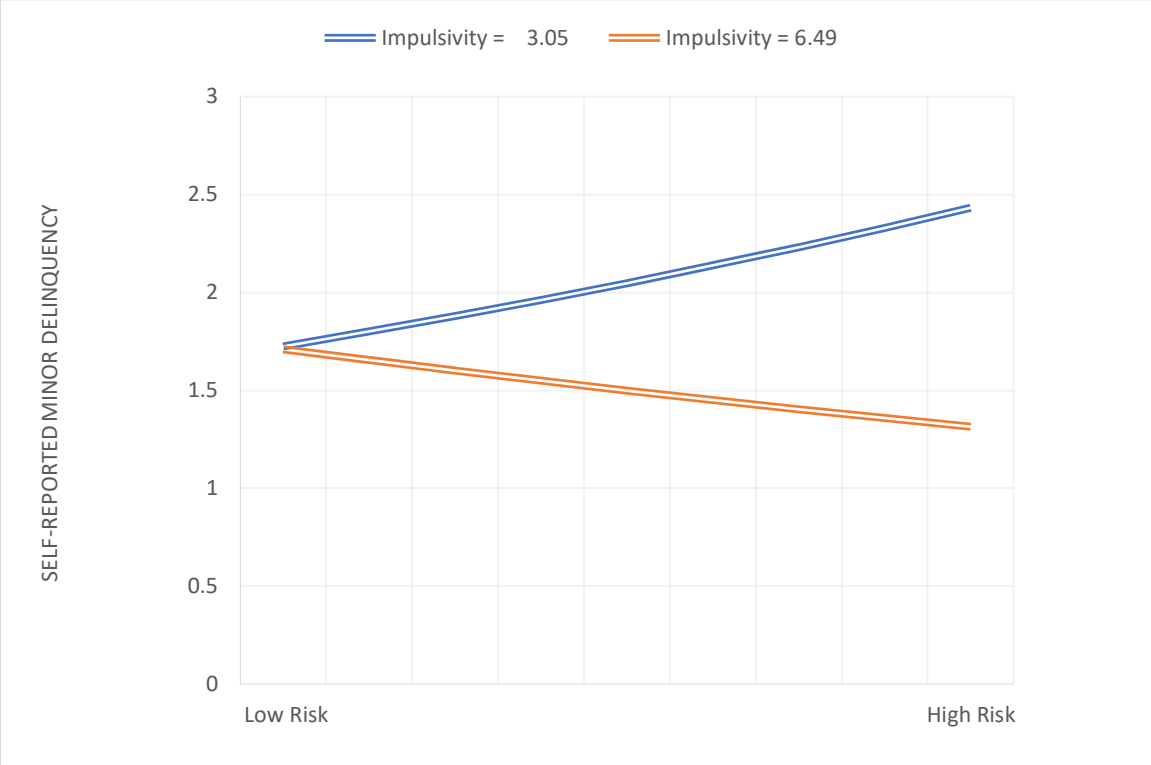
*p < 0.05 level

**p < 0.01 level

***p < 0.001 level

Source: Study of Peers Activities and Neighborhoods

Figure 1: *Graph of Interaction (Impulsivity by Risk-taking)—One Standard Deviation (1.72) Above and Below the Mean (4.77) of Impulsivity—on Self-Reported Minor Delinquency.*
(N=610)



Source: Study of Peers Activities and Neighborhoods

Appendix

Factor Loadings of Self-Control Items

Items for Composite and Component Scales

Risk-Taking (3-item)	Factor Loadings	Alpha if Removed
I sometimes find it exciting to do things that may be dangerous.	0.392	0.567
I often do things without thinking of the consequences.	0.555	0.716
Sometimes I will take a risk just for the fun of it.	0.830	0.540
Temper (4-item)		
When I have an argument with someone, I can talk it out calmly.	0.392	0.567
I get angry very fast.	0.828	0.394
When I am really angry, other people better stay away from me.	0.487	0.528
I get easily bored.	0.389	0.570
Impulsivity (2-item)		
I always say what I think, even if it is not nice or smart.	0.604	nvt
If I want something, I do it immediately.	0.604	nvt
Self-Control (10-item)		
I always say what I think, even if it is not nice or smart.	-0.016	0.725
If I want something, I do it immediately.	0.058	0.734
I can talk out arguments easily.	0.132	0.732
I get angry very fast.	-0.139	0.712
When I am really angry, other people better stay away from me.	0.035	0.726
I sometimes find it exciting to do things that may be dangerous.	0.620	0.710
I often try to avoid things that I know will be difficult.	0.056	0.751
I get easily bored with things.	0.189	0.731
I often do things without thinking of the consequences.	0.448	0.701
Sometimes I will take a risk just for the fun of it.	0.843	0.711

Source: Study of Peers Activities and Neighborhoods